

WHAT IS CLAIMED IS:

1. A composition comprising a polymer blend of:
 - a) a first random copolymer of propylene and at least one non-propylene C₂-C₂₀ α-olefin, said first random copolymer having a propylene content of above 90 up to about 99.5 weight percent, a melting point of above 116°C to about 145°C and which constitutes from about 60 weight percent to about 95 weight percent of the composition, and
 - b) a second random copolymer of propylene and at least one non-propylene C₂-C₂₀ α-olefin, said second random copolymer having a propylene content of above 85 up to about 97 weight percent, but no more than the propylene content of the first random copolymer, a melting point from about 70°C to no more than 116°C and which constitutes from about 5 weight percent to about 40 weight percent of the composition,
wherein said polymer blend may include a fraction soluble in xylene at 20°C, the xylene soluble fraction having a weight average molecular weight of more than 100 kg/mol and an intrinsic viscosity of above about 1.0 dl/g.
2. The composition of claim 1 wherein said xylene soluble fraction has a weight average molecular weight of above about 150 kg/mol.
3. The composition of claim 1 wherein said xylene soluble fraction has a weight average molecular weight of above about 200 kg/mol.
4. The composition of claim 1 wherein said xylene soluble fraction has a weight average molecular weight of above about 300 kg/mol.
5. The composition of claim 1 wherein said xylene soluble fraction has an intrinsic viscosity of above about 1.3 dl/g.
6. The composition of claim 1 wherein said xylene soluble fraction has an intrinsic viscosity of above about 1.6 dl/g.
7. The composition of claim 1 wherein said xylene soluble fraction has an intrinsic viscosity of above about 2.0 dl/g.
8. The composition of claims 1, wherein the polymer blend includes from 3 to 30 weight percent of ultra low crystallinity fractions, said ultra low crystallinity fractions being defined as the difference between the amount of xylene soluble components as determined at 20°C and 2 hours settling time and the amount of xylene soluble components as determined at

20°C and 5 days settling time.

9. The composition of claim 1 having a melt flow rate at 230°C and 2.16 kg of above 2 to about 15 g/10 min.

10. The composition of claims 1 wherein both random copolymers of the polymer blend were prepared by means of a metallocene catalyst.

11. A film having at least one layer fabricated from the composition of claim 1.

12. The film of claim 11, wherein the amount of hexane extractable fraction of the film layer comprises no more than about 3.0 weight percent.

13. A composition comprising a polymer blend of:

a) a first random copolymer of propylene and ethylene, said first random copolymer having a propylene content of above 90 up to about 99.5 weight percent and a melting point of above 116 °C to about 145 °C, and which constitutes from about 60 weight percent to about 95 weight percent of the composition, and

b) a second random copolymer of propylene and ethylene, said second random copolymer having a propylene content of above 85 up to about 97 weight percent, but no more than the propylene content of the first random copolymer, a melting point from about 70 °C to no more than 116 °C, and which constitutes from about 5 weight percent to about 40 weight percent of the composition,

wherein said polymer blend may include a fraction soluble in xylene at 20 °C, the xylene soluble fraction having a weight average molecular weight of more than 100 kg/mol and an intrinsic viscosity of above about 1.0 dl/g.

14. The composition of claim 13 wherein said xylene soluble fraction has a weight average molecular weight of above about 150 kg/mol.

15. The composition of claim 13 wherein said xylene soluble fraction has a weight average molecular weight of above about 200 kg/mol.

16. The composition of claim 13 wherein said xylene soluble fraction has a weight average molecular weight of above about 300 kg/mol.

17. The composition of claim 13 wherein said xylene soluble fraction has an intrinsic viscosity of above about 1.3 dl/g.

18. The composition of claim 13 wherein said xylene soluble fraction has an intrinsic viscosity of above about 1.6 dl/g.

19. The composition of claim 13 wherein said xylene soluble fraction has an intrinsic viscosity of above about 2.0 dl/g.

20. The composition of claim 13, wherein the polymer blend includes from 3 to 30 weight percent of ultra low crystallinity fractions, said ultra low crystallinity fractions being defined as the difference between the amount of xylene soluble components as determined at 20°C and 2 hours settling time and the amount of xylene soluble components as determined at 20°C and 5 days settling time.

21. The composition of claim 13, having a melt flow rate at 230°C and 2.16 kg of between 2 and about 15 g/10 min.

22. The composition of claim 13, wherein both random copolymers of the polymer blend were prepared by means of a metallocene catalyst.

23. A film having at least one layer fabricated from the composition of claim 13.

24. The film of claim 23, wherein the amount of hexane extractable fraction of the film layer comprises no more than about 3.0 weight percent.

25. A polymer blend composition comprising:

a) up to about 10 weight percent of a fraction soluble in xylene, determined either

i) as the amount of xylene solubles at 20 °C and 5 days settling time or

ii) as the amount of material eluted by temperature rising elution fractionation at 20 °C,

b) from 10 to 50 weight percent of a fraction of low crystallinity material, determined either

i) as the difference between the amount of material eluted by temperature rising elution fractionation up to 50°C and the xylene solubles at 20 °C and 5 days settling time or

ii) as the amount of material eluted by temperature rising elution fractionation at temperatures from 21°C to 50°C,

c) from 0 to 20 weight percent of a fraction of intermediate crystallinity material, determined as the amount of material eluted by temperature rising elution fractionation from

51°C to 60°C,

d) from 20 to 70 weight percent of a fraction of high crystallinity material, determined as the amount of material eluted by temperature rising elution fractionation from 61°C to 92°C,

e) and up to about 5 weight percent of a very high crystallinity material, determined as the amount of material eluted by temperature rising elution fractionation at temperatures larger than 92°C,

wherein the xylene solubles are determined at 20°C and 5 days settling time if temperature rising elution fractionation is carried out in steps between 40°C and 107°C with xylene as the solvent, or wherein the xylene solubles are determined as the 20°C fraction of the temperature rising elution fractionation if the temperature rising elution fractionation is carried out in steps between 20°C and 107°C with xylene as the solvent,

wherein the amount of material being eluted between 51°C and 60°C is smaller than the amount of material that is being eluted between 40°C and 50°C by at least 5 wt% based upon the total composition weight, and smaller than the amount of material that is being eluted between 61°C and 92°C by at least 40 wt%,

and wherein the blend contains from 3 to 30 weight percent of ultra low crystallinity fractions, said ultra low crystallinity fractions being defined as the difference between the amount of xylene soluble components as determined at 20°C and 2 hours settling time and the amount of xylene soluble components as determined at 20°C and 5 days settling time.

26. A composition comprising a polymer blend of:

a) a first random copolymer of propylene and at least one non-propylene α -olefin, said first random copolymer having a propylene content of between 90 and about 99.5 weight percent and a melting point of between 116°C and about 145°C, and which constitutes from about 60 weight percent to about 95 weight percent of the composition, and

b) a second random copolymer of propylene and at least one non-propylene α -olefin, said second random copolymer having a propylene content of between 85 and about 97 weight percent, a melting point between 70°C and 116°C, and which constitutes from about 5 weight percent to about 40 weight percent of the composition,

wherein crystallization of the second random copolymer attributable to nucleation by the first random copolymer is in accordance with the ratio of I:II wherein

I is the difference between (i) and (ii) wherein

(i) is the amount of xylene solubles, calculated proportionally to the blend composition from the individually determined xylene solubles of the two blend components, and

(ii) is the amount of xylene solubles actually measured in the blend, and

II is the amount of xylene solubles, calculated proportionally to the blend composition from the individually determined xylene solubles of the two blend

components.

27. A process for preparing a polypropylene copolymer composition comprising:
- providing a catalyst comprising a metallocene compound having the formula



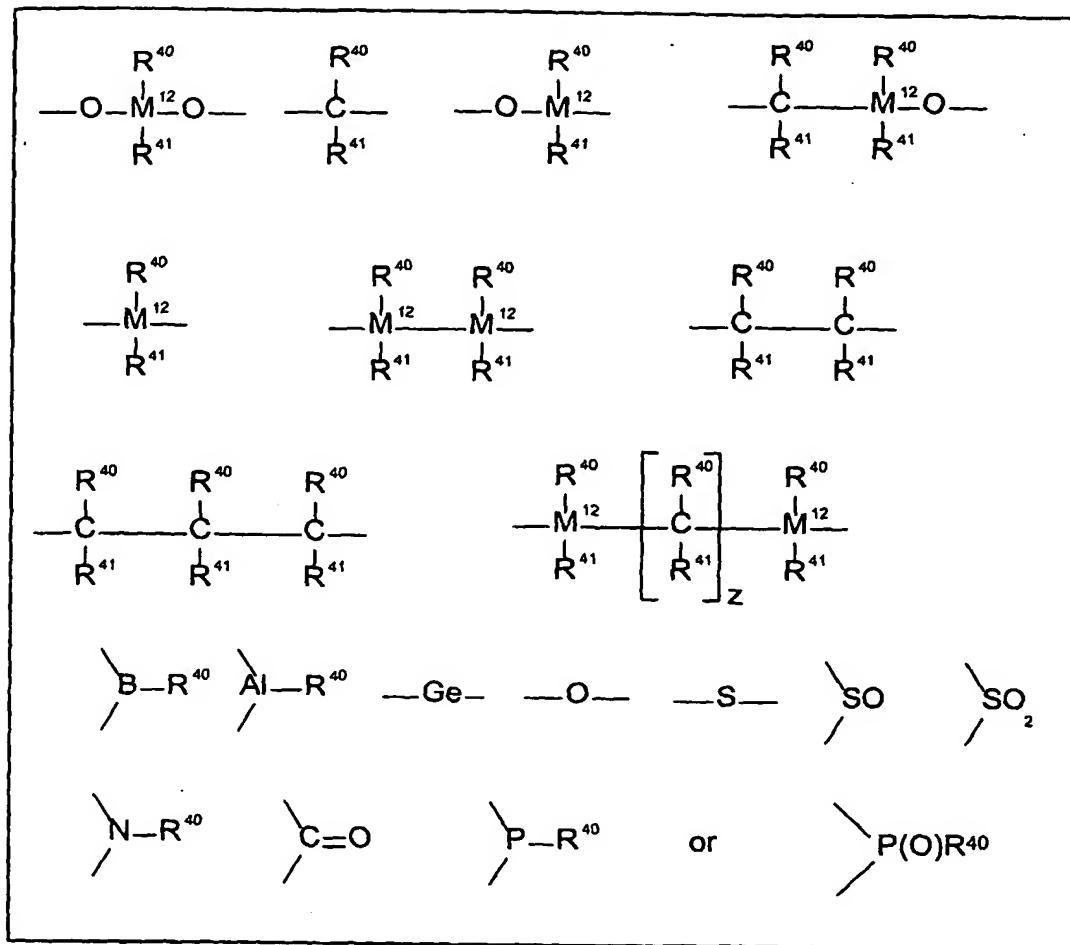
(Formula I)

wherein

M^1 is a metal of Group IVb of the Periodic Table of the Elements, L^1 and L^2 are identical or different and are each a substituted mononuclear or polynuclear hydrocarbon radical or (a) hetero atom(s) containing hydrocarbon radical(s), which form a sandwich structure with the central atom M^1 ,

R^1 and R^2 are identical or different and are each a hydrogen atom, an alkyl group of from 1 to about 10 carbon atoms, an alkoxy group of from 1 to about 10 carbon atoms, an aryl group of from 6 to about 20 carbon atoms, an aryloxy group of from 6 to about 10 carbon atoms, an alkenyl group of from 2 to about 10 carbon atoms, an OH group, a halogen atom, or a NR_2^{32} group, where R^{32} is an alkyl group of from 1 to about 10 carbon atoms or an aryl group of from 6 to about 14 carbon atoms, or R^1 and R^2 together can form one or more ring system(s),

R^9 is a bridge between the ligands L^1 and L^2 selected from the groups



wherein R^{40} , R^{41} can be identical or different, even when they have the same index, and are each a hydrogen atom, a halogen atom or a $\text{C}_1\text{-}\text{C}_{40}$ group such as a $\text{C}_1\text{-}\text{C}_{20}$ -alkyl group, a $\text{C}_1\text{-}\text{C}_{10}$ -fluoroalkyl group, a $\text{C}_1\text{-}\text{C}_{10}$ -alkoxy group, a $\text{C}_6\text{-}\text{C}_{14}$ -aryl group, a $\text{C}_6\text{-}\text{C}_{10}$ -fluoroaryl group, a $\text{C}_6\text{-}\text{C}_{10}$ -aryloxy group, a $\text{C}_2\text{-}\text{C}_{10}$ -alkenyl group, a $\text{C}_7\text{-}\text{C}_{40}$ -arylalkyl group, a $\text{C}_7\text{-}\text{C}_{40}$ -alkylaryl group or a $\text{C}_8\text{-}\text{C}_{40}$ -arylalkenyl group, where R^{40} and R^{41} may each, together with the atoms connecting them, form one or more rings, and z is an integer from zero to 18,

M^{12} is silicon, germanium or tin, and

R^9 may also link two units of the formula II to one another;

b) providing a first monomer mixture of propylene and at least one $\text{C}_2\text{-}\text{C}_{20}$ nonpropylene α -olefin in amounts such that the copolymer produced therefrom has a ratio of between 90 and about 99.5 wt % propylene units to between about 0.5 wt% and 10 wt% of the non-propylene α -olefin units;

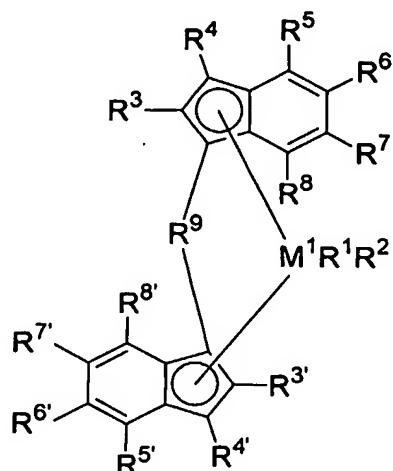
c) polymerizing the first monomer mixture in the presence of the metallocene catalyst under polymerization reaction conditions to form a first random copolymer having a melting point between 116°C and 145°C;

d) providing a second monomer mixture of propylene and at least one C₂-C₂₀ nonpropylene α -olefin in amounts such that the copolymer produced therefrom has a ratio of between 85 and about 97 wt % propylene units to between about 3 wt% and 15 wt% of the nonpropylene α -olefin;

e) polymerizing the second monomer mixture in the presence of the metallocene catalyst under polymerization reaction conditions to form a second random copolymer having a melting point between 70°C and 116°C; and

f) blending the first random copolymer and the second random copolymer to provide a polypropylene copolymer composition including about 60 wt% to about 95 wt% of the first random copolymer and from about 5 wt% to about 40 wt% of the second random copolymer based upon total composition weight.

28. The process of claim 27 where the catalyst comprises a metallocene compound having the formula



(Formula II)

wherein

M¹ is zirconium or hafnium

R¹, R², and the bridging unit R⁹ have the meaning set forth above with respect to formula I.

R⁴, R⁵, R⁶, R⁷, R⁸ and also R^{4'}, R^{5'}, R^{6'}, R^{7'} and R^{8'} are identical or different and are each a hydrogen atom, a linear, cyclic or branched hydrocarbon group, with or without heteroatoms, selected from an alkyl group of from 1 to about 10 carbon atoms, an alkenyl group of from 2 to about 10 carbon atoms, an aryl group of from 6 to about 20 carbon atoms,

an arylalkyl group of from 7 to about 40 carbon atoms, an alkylaryl group of from 7 to about 40 carbon atoms, an arylalkenyl group of from 8 to about 40 carbon atoms, a substituted or unsubstituted alkylsilyl or arylsilyl group and/or two adjacent radicals R⁵, R⁶ or R^{5'}, R^{6'}, or R⁶, R⁷ or R^{6'}, R^{7'}, or R⁷, R⁸ or R^{7'}, R^{8'} in each case may form a hydrocarbon ring system or R⁵ and R^{5'} are identical or different and are each a substituted or unsubstituted aryl group of from 6 to about 40 carbon atoms.

29. The process of claim 27, wherein the polymerizing steps (c) and (e) are performed using a reactor cascade composed of at least two reactors in series.

30. The process of to claim 29, wherein the polymerization is carried out in gas phase.

31. The process of claim 27 using hydrogen in polymerization steps (c) and/or (e) as a molecular weight regulator.

32. The process of claim 27 wherein the metallocene compound is selected from the group consisting of

dimethylsilandiyl(2-methyl-4-(para-tert-butyl-phenyl)-indenyl) (2-isopropyl-4-(para-tert-butyl-phenyl)-indenyl)zirconiumdichloride,

dimethylsilandiyl(2-ethyl-4- (4'-tert.butyl-phenyl)-indenyl) (2-isopropyl-4-(4'-tert.-butyl-phenyl)-indenyl)zirconiumdichloride,

dimethylsilandiyl(2-methyl-4- (4'-tert.butyl-phenyl)-indenyl) (2-isopropyl-4-phenyl-indenyl) zirconiumdichloride,

dimethylsilandiyl(2-methyl- 4-phenyl)-1-indenyl)(2-isopropyl-4-(4'-tert.-butyl-phenyl)- 1-indenyl)zirconiumdichloride,

dimethylsilandiyl(2-ethyl-4- (4'-tert.butyl-phenyl)-indenyl)(2-isopropyl-4-phenyl)-indenyl)zirconiumdichloride,

dimethylsilandiyl(2-isopropyl-4-(4'-tert.butyl-phenyl)-indenyl)(2-methyl-4,5-benzo-indenyl)zirconiumdichloride,

dimethylsilandiyl(2-methyl-4- (4'-tert.butyl-phenyl)-indenyl) (2-isopropyl-4-(1-naphthyl)- indenyl)zirconiumdichloride and

dimethylsilandiyl(2-isopropyl-4-(4'-tert.butyl-phenyl)-indenyl)(2-methyl 4-(1-naphthyl)-indenyl)zirconiumdichloride.